MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

BEM 1034 – MATHEMATICS FOR ECONOMICS

(All Sections / Groups)

04 MARCH 2020
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages, including a list of formulae.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1[Total =25 marks]

a) Solve for $\log_4(2x+1)-\log_4(x-3)=1$ [5 marks]

b) A market share S (in percentage) of a company expects t month after a new product is introduced is given by $S=40-40e^{-0.05t}$. How many months will it take for the market share to reach 25%? [5 marks]

c) For the following system of equations:

$$3x_1+8x_2-x_3=-18$$
$$2x_1+x_2+5x_3=8$$
$$2x_1+4x_2+2x_3=-4$$

(i) Write the system into matric form $AX=B$ [1 mark]
(ii) Find the determinant of matrix A. [2 marks]
(iii) Find the cofactor, adjoint and inverse of matrix A. [9 marks]
(iv) Using inverse method, solve the system of equations above. [3 marks]

Continued.....

Question 2[Total =25 marks]

a) For the following matrices,

$$A=\begin{bmatrix}1 & 0 & 3\\ 0 & 1 & 1\\ 1 & 2 & 1\end{bmatrix}, \quad B=\begin{bmatrix}3 & 0 & 0\\ 1 & 6 & 1\\ 5 & 2 & 4\end{bmatrix}, \quad C=\begin{bmatrix}-2 & 3 & 0\\ 1 & -4 & 1\end{bmatrix}$$

Perform the indicated operation:

(i) $C(A+B)$ [5 marks]

(ii) AB^T [4 marks]

b) The economy of a country has a rubber industry, palm oil industry and coconut industry, with the following technology matrix.

$$A=\begin{array}{c} \\ Rubber \\ PalmOil \\ Coconut \end{array}\begin{array}{c}\begin{bmatrix}R & P & C\\ 0.6 & 0.2 & 0.2\\ 0.1 & 0.4 & 0.5\\ 0.1 & 0.2 & 0.2\end{bmatrix}\end{array}$$

If the country wishes to have surpluses of 100 units of rubber production, 272 units of palm oil production and 200 coconut production, find the gross production of each industry.

[16 marks]

Continued.....

Question 3 [Total =25 marks]

a) Determine if the function $f(x)=\dfrac{x+3}{x^2-4}$ is continuous at $x=3$. [6 marks]

b) Find the values where the function $g(x)=\dfrac{x-6}{x^2+4x}$ is discontinuous. [3 marks]

c) Find the derivatives of the following function:

(i) $y=2x^7-\dfrac{5}{\sqrt{x}}$ [3 marks]

(ii) $y=\dfrac{e^{-4x}}{1+3x}$. [4 marks]

(iii) $y=x^3(1-3x)^2$ [4 marks]

d) If the utility function of an individual takes the form

$$U=\frac{x^2+1}{y}$$

where U is total utility and x and y are the quantities of two commodities consumed. Find the marginal-utility function of each of the two commodities. [5 marks]

Continued.....

Question 4[Total = 25 marks]

a) Solve the following integral:

(i) $\int \frac{5x^3 - 7x^2 - 2x + 4}{x^2} dx$ [4 marks]

(ii) $\int (4t^2 - 3t)^4 (8t - 3) dt$ [5 marks]

b) The number of units, x, demanded for a product depends on the unit price, p (in RM), and is given by

$$p = 16 - 0.005x^2$$

(i) Given that the equilibrium price is RM8, find the equilibrium quantity. [4 marks]

(ii) Calculate the consumer's surplus. [5 marks]

c) Solve the following implicit differential equation by separation of variables:

$$\frac{dy}{dx} = 4x^3 y - y$$ [7 marks]

End of page

Formulae:

1. **Input-Output Model**

$$(I - A)X = D$$

where A is the input-output matrix, D is the external or final demand and X is the production level.

2. **Consumers' Surplus (CS) and Producers' Surplus (PS)**

$$CS = \int_0^{\bar{x}} D(x)dx - \overline{px}$$

$$PS = \overline{px} - \int_0^{\bar{x}} S(x)dx$$

where $\bar{p}$ is the unit market price, $\bar{x}$ is the quantity sold, D is the demand function and S is the supply function.